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THE VARIATION OF PRODUCTIVE FORCES.

NEARLY a century has elapsed since the law of diminishing returns became an integral part of classical political economy ; and, despite all criticisms, it remains to-day one of the corner-stones of the science. But important additions have been made, notably during the last twenty years, to the accepted statement of the theory. In some industries the existence of a tendency to constant or increasing returns is predicated, so that commodities are now divided into three classes,— those produced under the conditions of diminishing returns, those which can be supplied with a constant expenditure of labor and capital, and those obtained at a decreasing cost, as the supply is enlarged. Such a mode of classification is widely employed in current discussions of value, monopolies, and the incidence of taxation, as well as in the study of the law of population.

It is the opinion of the author that, in developing what are now known as the laws of diminishing, constant, and increasing returns, economists have fallen into serious con-

fusion of ideas at several points; and not a few writers have shown some appreciation of this fact.\* But as yet no one has undertaken a critical examination of the relation of modern theories to the substance of the old doctrines, and offered a systematic statement of the results reached by a century of discussion.† To this end it is hoped that the present essay may contribute something of value.

## I.

A brief survey of the early development of the theories in question will throw no little light upon the nature of the problems to be attacked, and will suggest, furthermore, a convenient method of procedure. Thanks to the labors of Mr. Cannan, it will be possible to state very briefly the history of the doctrines down to the year 1848.‡

As every economist is now aware, the law of diminishing returns was originally formulated in the course of the discussions aroused in England by the high price of corn that ruled during the early years of the nineteenth century. As stated by Malthus, West, and Ricardo, the principle was applied to agriculture; and it was held § that, "in the progress of the improvement of cultivation, the raising of rude produce becomes progressively more expensive, or, in other words, the ratio of the net produce of land to its gross produce is continually diminishing." In manufacturing industry, however, it was believed that

\* See Marshall, *Economics*, 4th edition, 511, 512; Hadley, *Economics*, 154, 155; Seligman, *Shifting and Incidence of Taxation*, 2d edition, 199-201.

† For the best effort yet made in this direction, see Commons, *The Distribution of Wealth*, 116 *et seq.*

‡ E. Cannan, *History of Theories of Production and Distribution*. See also *Economic Journal*, March, 1892; Palgrave's *Dictionary of Political Economy*, i. 585, 586; *Quarterly Journal of Economics*, ix. 179 *et seq.*

§ West, "Essay on the Application of Capital to Land" (1815); Malthus, "Nature and Progress of Rent" (1815); Ricardo, "Essay on the Influence of a Low Price of Corn on the Profits of Stock" (1815).

a different law prevailed, so that additional investments of labor and capital would yield a proportionate increase of product.\* And, until comparatively recent times, economists have continued to express similar opinions.

But, as originally stated, the law of diminishing returns admitted of two interpretations: it might mean that, *at any given stage of agricultural knowledge or skill*, a point is soon reached at which increased investment begins to yield a smaller proportionate product; or it might be considered to imply that, *as a matter of historical fact*, mankind has had to expend a larger relative amount of labor and capital in order to provide the additional food necessary to support a growing population. Upon at least one occasion Ricardo made the former application of the principle, basing his argument upon the assumption that no improvements are introduced in agricultural methods; but usually the early writers adopted the latter interpretation of the law, and held that, despite all discoveries and inventions, the growth of population must ultimately increase "the quantity of labor and capital necessary to procure the last addition that has been made to the raw produce of a rich and advancing country."† Against such a dismal view of the future of the race, several protesting voices were raised before many years had passed.

Thus, in 1828, Senior declared that, while unwise laws might have such an effect, "under wise institutions" the tendency was not what economists had alleged, but precisely the reverse.‡ In 1832 Thomas Chalmers contended that, while the law of diminishing returns may have driven men to the utilization of inferior soils, neverthe-

\* This is true of Malthus, West, Senior, McCulloch, and Mill. Palgrave, *Dictionary of Political Economy*, ii. 381. In treating of the rent of mines, it was held that diminishing returns were the rule. Note Ricardo, *Principles*, chap. iii.

† The quotation is from Malthus, *Nature and Progress of Rent*, 45. But citations might be given to the writings of West, Ricardo, James Mill, and McCulloch.

‡ Senior, *Two Lectures on Population* (1828).

less improvements in the arts of agriculture have made the labor now employed upon poorer margins of cultivation as productive as that formerly expended upon lands of superior fertility.\* Finally, Henry C. Carey attacked the assumption, often implicit in the statements of Ricardo and others, that the richest soils are historically the first to be occupied, and that the growth of numbers forces men to utilize less fertile lands.† But all such criticisms did not prevent most economists from holding to the belief that, although the opening up of new countries and the progress of invention might serve to retard the process, yet, in the end, a continuous increase of population would inevitably result in a decreased return to the labor and capital devoted to the production of the additional food supply.

Although Senior, in his *Political Economy* (1836), made important additions to the statement and applications of the law of diminishing returns, we may pass on to the consideration of the views of John Stuart Mill, who adopted Senior's ideas, and made further contributions to the subject. The attention of the reader is invited, therefore, to Mill's treatment of agricultural production, large-scale industry, value, and taxation.

“After a certain, and not very advanced, stage in the progress of agriculture,” says Mr. Mill,‡ “it is the law of production from the land that, in any given state of agricultural skill and knowledge, by increasing the labor the produce is not increased in equal degree.” Here the application of the law is limited to “any given state of agricultural skill and knowledge,” that is, to static conditions. But most of Mill's discussion relates to the actual or prospective progress of population and of agri-

\* *Political Economy*, chap. i. (1832).

† H. C. Carey, *Political Economy* (1837-40); *Past, Present, and Future* (1848); *Social Science* (1858-59).

‡ *Principles of Political Economy*, Book I. chap. xii. sect. 2 (1848). Note the similarity to Senior's statement in his *Political Economy*, 82.

cultural production ; and, although his statements may not always seem consistent, there can be no doubt that he considered that discovery and invention could control only temporarily the tendency toward diminishing returns, so that ultimately additional food must be procured "on progressively harder terms."\* And this he believed to be true of mining and other extractive industries, as well as of agriculture.† With manufactures, however, the case was supposed to be different.‡ So far, indeed, as the supply of raw materials is concerned, manufacturing industry was admitted to be subject to the law of diminishing returns ; but the labor of converting materials into finished goods was thought to tend "constantly and strongly towards diminution, as the amount of production increases," so that "the causes tending to increase the productiveness of industry, preponderate greatly over the one cause which tends to diminish it."

A second topic, which has played an important part in subsequent discussions, was treated by Mill in a separate chapter devoted to a comparison of large-scale and small-scale production. The subject was suggested to him, perhaps, by the well-known work of Mr. Babbage, who, better than any previous writer, comprehended the economic effects of the factory system.§ Drawing many of his facts from this source, Mill discussed the advantages and disadvantages resulting from the enlargement of the size of an industrial undertaking ; || and held that, as a general rule, "the expenses of a business do not increase by any means proportionally to the quantity of business." In referring to such industries as railroads and gas or water companies, he said that all "enlargement in the scale of produc-

\* *Principles*, Book I. chap. xii. sect. 3 ; Book IV. chap. iii. sect. 5.

† *Principles*, Book I. chap. xii. sect. 3.

‡ *Principles*, Book I. chap. xii. sect. 3. Cf. Senior, *Political Economy*, 81-83.

§ Babbage, *Economy of Machinery and Manufactures* (1832).

|| *Principles*, Book I. chap. ix.

tion is generally an unqualified benefit," thus anticipating the modern theory of natural monopolies.

In presenting the theory of value, Mill divides commodities into three classes: (a) those "of which it is physically impossible to increase the supply beyond certain narrow limits"; (b) those "which are susceptible of indefinite multiplication without increase of cost"; and (c) those "which are susceptible of indefinite multiplication, but not without increase of cost."\* This classification, which is but an elaboration of distinctions drawn by Ricardo,† is based, obviously, upon particular applications of the theory of monopoly, the economy of large-scale production, and the law of diminishing returns. With more or less important modifications, it has played a significant part in modern discussions of the theory of value.

And, finally, in treating of the incidence of taxation, Mill makes an important distinction between the effects of a tax imposed upon raw products, secured under conditions of diminishing returns, and other commodities that are free from such limitations of supply.‡ Here, again, subsequent theories have found a new point of departure.

For two reasons Mill's discussion of these topics possesses peculiar significance. In the first place it summed up nearly all the results reached by earlier writers; and then it left the theory in a position that was certain, in the course of time, to lead to important modifications and

\* *Principles*, Book III. chap. ii. sect. 2. Cf. also the table of contents.

† Ricardo recognized commodities "the value of which is determined by their scarcity alone," and commodities which "are procured by labor." The second class would subdivide into manufactured products and raw produce, the latter being secured under conditions of decreasing returns. I shall pass over Senior's somewhat peculiar classification, which has not been followed by later writers. *Political Economy*, p. vii. But, in discussing the effect of increased demand upon supply, Senior distinguished between raw produce and manufactured commodities.

‡ *Principles*, Book V. chap. iv. In this matter, Mill follows the argument of Senior. Cf. Senior, *Political Economy*, 120 *et seq.* Cournot, in his treatment of taxes on commodities, had considered the influence of diminishing and increasing returns. Cournot, *Théorie des Richesses* (1838).

extensions. It is evident that the subjects treated by Mill included two things that far transcended the scope of the original law of diminishing returns. That principle had related to the productivity of labor and capital when employed in the cultivation of land or the utilization of other natural resources. But Mill proceeded to discuss the efficiency of productive agents when organized in manufacturing establishments of varying size, thus introducing a very different problem, as economists are now coming to realize. Finally, in treating of the law of value and the incidence of taxation, Mill looked at the process of production from still another point of view,—the conditions that govern the entire supply of any particular commodity; and this involved a third set of considerations that needs to be carefully distinguished from the other two. Subsequent writers have discussed all three problems, but have seldom appreciated the fact that different principles are involved in every case, and that, in each instance, we are obliged to study the process of production from a different point of view. For this reason, in presenting the later history of the theories in question, we shall treat separately each of the three problems considered by Mr. Mill.

## II.

First in order of both logical and historical development comes the law of diminishing returns. This principle, as we have seen, admits of two interpretations, the static and the dynamic, of which we shall now consider the former.\* Assuming a particular state of the arts of production, economists have had little difficulty in recognizing that

\* Ricardo, in his "Essay on the Influence of a Low Price of Corn," considered static conditions. So did Senior and Mill when they made the assumption, "agricultural skill remaining the same." Senior, *Political Economy*, 82; Mill, *Principles*, Book I. chap. xii. sect. 2. For later writers see Marshall, *Economics*, 227; Nicholson, *Political Economy*, i. 152.

in the extractive industries the continued investment of labor and capital upon any given tract of land will, after a certain point is reached, yield a diminishing proportionate return. But, in considering manufactures and commerce, most writers have followed Senior and Mill in holding that these industries are governed by a different law.\*

Yet, as Professor Commons has so clearly shown,† when we study the investment of labor and capital *upon a given tract of land*, we find that all industries show a diminishing return after the investment of labor and capital has been carried to a certain point.‡ Under given technical conditions, factories, and even office buildings in large cities, will not be raised beyond a certain number of stories, since better results can finally be secured by resorting to construction upon other land. Oversight of this fact is due to a failure to consider agriculture and manufactures from the same point of view, namely, the possible extent of investments upon a given area.§

\* Cairnes, *Leading Principles*, 118, 132-134; Sidgwick, *Political Economy*, 2d edition, 144; Walker, *Political Economy*, 3d edition, 38, 39; Gide, *Political Economy*, 329; Clark, *Philosophy of Wealth*, 97, 100. Some writers, without expressly stating that manufactures are governed by a different principle, apply the law only to agriculture and mining. Fawcett, *Manual of Political Economy*, 6th edition, 74; Newcomb, *Political Economy*, 242.

† Commons, *Distribution of Wealth*, 116, 117; also, in *Publications of the American Economic Association*, viii. 101.

‡ This is recognized by Marshall, *Economics*, 246, 247; Nicholson, *Political Economy*, i. 159, 160; Commons, *Distribution of Wealth*, 132-134; Bullock, *Introduction to Economics*, 2d edition, 167-170.

§ Ricardo and Malthus applied the law of diminishing returns to the cultivation of given tracts of ground, when they spoke of land of the first quality, land of the second quality, etc. Senior explicitly applies the law to "additional labor employed on the land in a given district." *Political Economy*, 82. Mill discusses "the quantity of produce capable of being raised on any given piece of land." *Principles*, Book I. chap. xii. sect. 1. Later writers do the same thing. Walker, *Political Economy*, 35; Newcomb, *Political Economy*, 242; Hadley, *Economics*, 43; Clark, *Distribution of Wealth*, 165; Palgrave, *Dictionary of Political Economy*, i. 585. But, when manufactures are considered, no such limitation is implied; and writers consider either a manufacturing establishment that is free to extend its operations over additional land or the industry of manufactures as a whole.

Without doubt an important difference exists between the industries in question. In agriculture it is possible to invest only a small or moderate amount of labor and capital upon a definite area before the point of diminishing returns is reached, while in manufactures and commerce enormous investments can be made even upon a single acre. Yet the only difference is one of degree, and the same law ultimately applies in both cases. No exception can be taken to Mr. Cannan's statement\* that the "fact that a certain amount of space is required for productive labor in other branches of industry is of little practical importance as regards the effect of variations of population on the productiveness of all industry taken together, because these branches of industry require very little space compared with agriculture." But for the study of other questions it is very necessary to remember that investments upon a given area of land are subject to diminishing returns in all industries.

This will become evident when we consider that the classical theory of rent is based upon a comparison of the productivity of investments made upon definite tracts of land. So far as agricultural rent is concerned, this statement is a mere commonplace. But the traditional formula for the determination of rent could not apply to land used in manufactures and commerce unless a law of diminishing returns governed investments made upon given areas employed for such purposes.† For the study of distribution, therefore, the static aspect of this principle is of most fundamental importance.

Under static conditions, then, the law of diminishing

\* Cannan, *Elementary Political Economy*, 24, 25. Cf. Hadley, *Economics*, 155, note.

† This is recognized by Marshall and Commons. The former (*Economics*, 246, 247), after showing that "building land does give a diminishing return," says that "the theory of ground rents is substantially the same as that of farm rents." The latter (*Distribution*, 134) says that, if "diminishing returns apply only to agriculture, there can be no law of rent for manufacturing and mercantile sites."

returns governs investments of labor and capital made in any industry upon a given area of land.\* This principle has usually been proved by showing that, if it were not true, all production would be conducted upon a few favored tracts;† but there are not wanting actual experiments that seem to confirm the law.‡ This much, at least, of the traditional body of economic doctrine has successfully withstood both earlier and later criticism.§

Passing now to the dynamic applications of the law of diminishing returns, we find that this aspect of the principle has always been of the greatest interest to economists, who have been especially concerned with the probable effects of an increase of population upon the conditions that control the supply of food. Even when they have not believed that the productivity of agriculture has actually decreased in the past, writers have generally held that the future growth of numbers must ultimately com-

\* Few economists, probably, would refuse to accept the law as stated. Professor Patten's "law of limited returns" has been criticised by Sidgwick, and has been rejected by one of his own disciples. Patten, *Premises of Political Economy*, 155, 182; Sidgwick, *Political Economy*, 293; Devine, *Economics*, 346, 347.

† Professor Patten says that Mill "was the first to try to prove the law of diminishing returns." But Senior had advanced in 1836 the line of proof referred to in the text. *Political Economy*, 85. To this method of proving the law, Professor Patten objects that his own "law of limited returns" would explain the fact that men have recourse to poorer soils. This may be granted. *Premises of Political Economy*, 152-154. But if, as Professor Patten contends, the returns increase proportionately up to the point where no additional product can be secured by any increase of the investment, then men would not resort to poorer lands until the absolute limit of productivity had been reached on the better soils. And this is not the case.

‡ For pertinent estimates by Von Thünen, see *Der isolirte Staat*, ii., i. 179 (quoted by Roscher, *Political Economy*, ii. 17, note 5). See reference given by Marshall, *Economics*, 232, note.

§ It is impossible to consider here Professor Commons's application of the principle to the *value* of the product of a given area as well as to the *quantity*. *Distribution of Wealth*, 138-140. I believe, however, that the essential facts for which Commons here contends can be stated satisfactorily without introducing this refinement of the theory. Cf. Marshall, *Economics*, 229, 230.

pel mankind to procure the means of subsistence upon "progressively harder terms." \*

But it is evident that, in order to study the influence of increased population upon social prosperity, it is necessary to pass from our present standpoint,— the productivity of investments made upon a definite tract of land,— and consider the productivity of the agricultural industries of an entire country or of the civilized world. When the latter question is raised, we at once involve ourselves in problems that cannot be solved by the sole aid of the laws applicable to the investments upon any given area. Manifestly, these principles are one factor in the situation ; but they are not the only thing involved, so that we cannot hope to discuss adequately the question of social prosperity from the narrow point of view now under consideration.

All that can be done, so long as we confine ourselves to the productivity of investments upon a given area, is to say that in agriculture the point of diminishing returns seems to be reached when a relatively small amount of labor and capital has been expended, so that, as population increases, a much larger amount of land must be taken into cultivation. And, upon the other hand, in manufactures and commerce the intensity of profitable investment upon a small area is so great that the need of resorting to additional land in order to secure more standing room, is not likely to exercise any material influence upon the productivity of these industries. To the question of social prosperity the study of our first standpoint can contribute nothing more decisive than this ; but for the theory of distribution, which involves primarily the static aspects of the principle, the law of diminishing returns from investments upon a given area is of far-reaching importance.

\* Mill, *Principles*, Book I. chap. xii. sect. 3; Book IV. chap. iii. sect. 5; Cairnes, *Leading Principles*, 119 ; Walker, *Political Economy*, 313, 314 ; Macvane, *Political Economy*, 314.

In order to avoid any possible confusion in the use of terms, the expression "diminishing returns" will be applied hereafter solely to the productivity of labor and capital upon a definite tract of land. In discussing the problems that remain to be considered, we shall find that the operation of other principles is involved besides the law just mentioned. For these other principles different names should be used; and it is hoped that a consequent gain in clearness of thought and presentation will justify our insistence upon the need of greater precision in terminology.

### III.

After the publication of Mill's *Principles* it became almost the fashion for treatises on economics to devote one or more chapters to the subject of production upon a large and upon a small scale;\* and in recent years many special studies have been made of the "size of the modern business unit" or of "the structure of modern industry."† As Professor Commons has clearly shown,‡ and one or two other writers have suspected,§ this problem is very distinct from that involved in the law of diminishing returns. Instead of studying the results obtained from investments upon a given area of land, we have now to investigate the efficiency of the productive process when carried on in establishments of various sizes that occupy as much or as little land as may be required. The important difference between the two points of view will be made increasingly apparent in the following paragraphs.

\* Fawcett, *Political Economy*, chap. vi.; Gide, *Political Economy*, Part II, chap. i.; Marshall, *Economics*, Book IV. chap. xi.; Nicholson, *Political Economy*, Book I. chaps. viii. and ix.

† Taylor, *History of the Factory System*; Wells, *Recent Economic Changes*; Schultze-Gaevertz, *Der Grossbetrieb*; Hobson, *Evolution of Modern Capitalism*. The earlier work of Babbage has already been cited. See, finally, Willoughby, in *Yale Review*, vii. 72-94.

‡ *Distribution of Wealth*, 117, 130-132.

§ Marshall, *Economics*, 511, 512; Hadley, *Economics*, 154, 155, note.

The growing importance of capital, especially of the fixed variety, during the nineteenth century led to a marked increase in the size of the average business unit; and, naturally enough, attracted the attention of economists. In recent years this enlargement of the scale upon which single firms or companies operate has gone so far as to produce actual monopoly in many industries, and to appear to threaten it in many others. No one doubts that, within certain limits at least, "the expenses of a business," to use the words of Mr. Mill, "do not increase by any means proportionally to the amount of business done." But diversities of opinion exist concerning the extent of the economies realized after an undertaking has assumed a certain size.

Doubtless differences exist between the various classes of undertakings. In the field of transportation and of the so-called distributive industries, probably no economist would question that "the industrial units which are necessary for proper utilization of labor have become so large as to produce actual monopoly."\* In manufactures the existence of the same tendency is maintained by the advocates of the modern trust; but, upon the other hand, not a few economists believe that a point of maximum efficiency of plant is attained before a single establishment becomes so large as to monopolize the whole field.† In agriculture the case seems to be materially different, so much so that the whole drift of recent opinion is that the movement towards concentration has made no headway in this industry.‡

\* Hadley, *Economics*, 153.

† For a survey of the literature and an estimate of the results the writer will refer to an earlier paper published in this journal. See vol. xv. 191-203.

‡ In England there has been a tendency towards a less favorable view of "small farming" than Mill entertained. Cf. Mill, *Principles*, Book I, chap. ix, sect. 4, with Nicholson, *Political Economy*, i. 138-150. In the United States, one or two decades ago, the growth of a few "bonanza" farms led some writers to express the opinion that the tendency towards production on a large scale was strong even in agriculture. See Wells, *Recent Economic*

So far as our present experience is concerned, therefore, it seems impossible to formulate any single law that will be applicable to all classes of business. In the distributive industries it is clear that increased investment of labor, capital, and land in a single enterprise results in continued economies up to a point at which a single company secures control of the entire supply.\* In agriculture, however, the advantages of production on a large scale generally disappear after the business unit attains a very moderate size. Concerning manufactures a controversy now exists, and economists are divided in opinion as to the extent to which the enlargement of the scale of undertaking increases the efficiency of production.†

The purpose of this paper is not to formulate a law governing the economy of large-scale production in manufactures or in any other industry, but rather to show the nature of the problems here involved. It is clear that we are now dealing with the efficiency of industrial organiza-

*Changes*, 99, 461-465. But events of the last ten years seem to point in the opposite direction, and it is now asserted that the small farm is more than maintaining its own. Spahr, in *Outlook*, November 4, 1899; Ely, *Monopolies and Trusts*, 192-195; *Publications of American Statistical Association*, vi. 306. A recent socialistic writer, although naturally "inclined toward the concentration idea," admits that the farm of moderate size is growing at the expense of the two extremes. Simons, *The American Farmer*, 101.

\* Obviously, there is some ultimate limit to these economies, else all cost would disappear. We mean simply that no limit is reached before a monopoly is established.

† Cournot, in constructing the "supply schedule" of a single producer or firm, seemed to hold that, as the volume of business increased, the cost of production generally decreased indefinitely, in manufactures, at least. *Mathematical Principles of the Theory of Wealth*, American translation, 59. Such a condition, of course, would inevitably result in monopoly. Marshall notices this (*Economics*, 514, note), and presents reasons for thinking that, as a matter of fact, the growth of a single firm or company will be arrested before monopoly is attained. *Economics*, 364-366, 394, 395. Ely holds that, after a business has attained a certain size, "new fixed charges emerge" with any further enlargement of the output. *Monopolies and Trusts*, 65-66, 165. Seligman makes a similar contention, but does not state clearly whether the new fixed charges appear before or after the point of monopoly is reached. *Shifting and Incidence of Taxation*, 201. See, finally, *Quarterly Journal of Economics*, xv. 198, 199.

tion as it relates to the size of the business unit, without any restriction as to the area of land over which investments may be extended. In order to avoid confusion of terms, it is proposed to refer hereafter to the principle or principles governing large-scale production as "the law of economy in organization."

If doubts are still entertained concerning our contention that the law of economy in organization differs in nature very widely from the law of diminishing returns, a single illustration will serve to make the point entirely clear. Professor Marshall cites the following experiment in proof of the law of diminishing returns. Four plots of land "of an acre each were treated exactly alike, except in the matter of ploughing and harrowing, with the following result":—

<i>Plot.</i>	<i>Cultivation.</i>	<i>Product per acre.</i>
1.	Ploughed once . . . . .	16 bushels
2.	Ploughed once and harrowed once . . . . .	18½ "
3.	Ploughed twice and harrowed once . . . . .	21½ "
4.	Ploughed twice and harrowed twice . . . . .	23½ "

With this table let us compare another which can be constructed from data given by Mr. Wells concerning the economy of large-scale production on the Pacific coast. The figures are drawn from a doubtful source, and their accuracy is open to question; but they illustrate perfectly the character of experimental proof relating to the law of economy in organization:—

<i>Size of ranch.</i>	<i>Cost of each unit of product.</i>
1,000 acres . . . . .	92½ cents
2,000 " . . . . .	85 "
6,000 " . . . . .	75 "
15,000 " . . . . .	60 "
30,000 " . . . . .	50 "
50,000 " . . . . .	40 "

But, although the two principles are distinct, nevertheless a relation exists between the law of diminishing re-

turns and the law of economy in organization. The former principle is one, but only one, of the factors upon which the second depends. In industries where only a small amount of capital can be concentrated upon a given area of ground the difficulties of organizing business upon a large scale are materially increased.\* In agriculture, for instance, if a farmer wishes to enlarge his output, he must increase greatly the size of his farm; and this adds materially to the cost of supervision, and renders difficult the study of the varying capabilities of each small tract of land. But many other factors besides diminishing returns from a given area enter into the determination of the efficiency of production upon a large scale.

First comes the all-important factor, economy in fixed capital, which usually makes for concentration. Then there is the need for skilful business management, which requires far greater ability as an establishment grows to colossal proportions. Again, the problem of finding a market for the increased output is sometimes an important consideration, especially in the case of commodities that are "specialties," appealing to a fickle public taste or a local demand. Doubtless other factors could be mentioned, but we have suggested a sufficient number to show that the law of diminishing returns from a given area is only one element that contributes to a complex result.

If this view of the case is correct, it is evident that we cannot co-ordinate the law of diminishing returns and the law of economy in organization. Yet this is what many writers appear to do when they say that agriculture is subject to a law of diminishing returns, and that a law of increasing returns governs most branches of manufactures. Such a statement confounds two distinct problems,—investment upon a given tract of land and investment in business units that extend over any requisite area; and it co-ordinates two principles that are not of the same

\* This is clearly stated by Mr. Marshall. *Economics*, 366.

order, of which the former is but one of a number of factors upon which the operation of the latter depends. It is in order to avoid even the implication that the two principles are co-ordinate, or that they relate to the same problem, that we have suggested the adoption of a change in terminology, by which "economy in organization" will be substituted for "increasing returns."

#### IV.

It has been shown that Mill, in his discussion of the theory of value, elaborated a classification of commodities which was based upon the three sets of conditions that were believed to control the supply. In one form or another a similar method of procedure has been adopted by most subsequent writers, and this tendency of economic thought is especially marked at the present day.

We have already intimated that Mill's classification raised a third distinct problem which must be distinguished carefully from those presented by the investment of labor and capital upon a given area or in a given business unit of any particular size. Mill refined his statement of the laws of value by considering the circumstances under which the entire supply of any commodity is secured, and in so doing adopted a third point of view for studying the efficiency of the process of production. A failure to recognize this fact has caused no little confusion in several directions, and has led to one erroneous application of modern theories of value.

It is important to notice, first of all, that the conditions controlling the supply of any commodity may be studied from two points of view,—the static and the dynamic. In the first case,\* we assume that the conditions of production remain stationary, and then inquire what the circum-

\* Note Marshall, *Economics*, 430-441.

stances are under which the commodity is supplied. In the second, we suppose that one cause or another changes the state of the industry, and proceed to investigate the consequent alteration of the terms upon which production will be carried on. It is from the static point of view that we need to formulate the theory of normal value, while the dynamic aspects of the question must be considered when we study the effects that changes of demand will exercise upon the conditions of supply. Both aspects of the problem must now be treated, and in the order just mentioned.

*A. Supply under Static Conditions.*—If we assume that the arts of production remain stationary, the supply of any commodity may be secured under two conditions,—monopoly and competition. In the former case it is evident that all the units of the supply will be furnished at what must be regarded as a uniform cost.\* This does not mean that all units of the monopolist's capital are equally efficient, but simply that our methods of book-keeping compel us to average up the results, and to assume that each unit of product is furnished at the same cost.† This cost may, and often does, vary with the amount of the commodity that is produced. But for each quantity of the supply it must be regarded as uniform.‡

The reader will observe that, when we assume a monop-

\* This presupposes, of course, an absolute monopoly. Usually, some residual competition remains; and differences of cost appear in this portion of the supply. But the theory of monopoly value disregards the small amount supplied in this way.

† In the case of a single establishment which extends its scale of operations until it monopolizes the entire field, this conclusion is obvious. If, however, the monopoly is formed by the union of a number of different establishments, then, at the outset, it would be possible to recognize that the various factories had different costs. But the monopolist would endeavor, even in this case, to raise the several plants to the same scale of efficiency; and this process would finally eliminate the differences that might have existed at the start. With an established monopoly, therefore, we may affirm that the separate units of product will be supplied at a uniform cost.

‡ This is recognized by Seligman, *Shifting and Incidence*, 195, 196.

oly to exist, this third standpoint for viewing the process of production becomes the same as the second, since the conditions controlling the entire supply of the commodity are, by hypothesis, identical with those which determine the efficiency of a single firm.\* But the similarity ends as soon as we assume that an industry is controlled by competition ; for, under such circumstances, we assume that there are several or many independent firms, no one of which can represent precisely the conditions under which the whole supply is produced.†

Now, when competition exists, the supply is furnished under conditions that bring it about that the various units are produced at different costs. Mill and many other economists have often reasoned in a manner that would lead one to suppose that they believed in the existence of a large class of commodities furnished by competing producers at the same cost. Thus Mill states that commodities of his third class, which includes "all the raw produce of the earth," have "not one, but several costs"; while goods of his second category, which embraces "the large class" of manufactured articles, are supposed, by fair implication, to be supplied at a uniform cost.‡ The value of products of the former class is governed by the cost of producing the most expensive unit, while that of the latter class depends simply upon "cost of production." Sidgwick expressly states that there may be cases "where the cost of production can be assumed to be the same for all producers," and contrasts this condition with that represented by "Mill's third class, of which the cost of production must be taken to be different for different por-

\* Cf. Commons, *Distribution of Wealth*, 130.

† Cf. Marshall, *Economics*, 511-514.

‡ See Mill, *Principles*, Book III. chap. ii. sect. 2 ; chap. iii. sect. 1 ; chap. v. sect. 1. I am aware that Mill is not always consistent on this point. See Book III. chap. vi. sect. 1, par. vii. But, unless he really means that his second class of goods is produced at a uniform cost, his remarks concerning the third class are meaningless.

tions of the aggregate amount produced."\* And other writers have interpreted Mill in a similar manner.†

Professor Marshall approaches the problem in a somewhat different way, but his statement of the case is influenced evidently by Mill's method of classification.‡ In treating of the value of raw produce, he recognizes the existence of different costs, and says that value depends upon "the cost of production on the margin of the profitable application of capital and labor." Then, when he considers other commodities, he introduces the device of "the representative firm," and holds that the value of an article "may be taken to be its normal expenses of production (including gross earnings of management) by that firm." The same method is followed by Mr. Flux, and, perhaps, by President Hadley.§ Now the "representative firm" of which these writers speak is defined as a firm free from the disadvantages of some struggling new producer, and not enjoying the unusual advantages of an exceptionally efficient company, but one that is managed with "normal ability" and "fair success."|| This definition is plainly inconsistent with the assumption that all producers furnish their supplies of manufactured products at a uniform cost, and is a recognition of the fact, for which we are now contending, that all products, manufactured as well as agricultural, are, under competitive conditions, supplied at varied costs.

And this is the view that not a few economists have

\* *Political Economy*, 196, 197.

† See Fawcett, *Political Economy*, 315, 316, 325, 339; Adams, *Science of Finance*, 390-392; and *Outline of Lectures on Political Economy*, 2d edition, 25. Nicholson, also, distinguishes commodities "continuously and permanently produced at different costs" from those that can be "increased indefinitely at the same cost per unit." *Political Economy*, ii. 54, 56.

‡ *Economics*, 479, 480, 422.

§ Palgrave, *Dictionary of Political Economy*, iii. 607, 608; Hadley, *Economics*, 88, 89. Hadley does not use the expression "representative firm." For this he substitutes producers who have neither "the advantage of old locations" nor "the disadvantage of old methods."

|| Marshall, *Economics*, 397.

taken when discussing the simpler problems connected with normal value.\* When scores or hundreds of independent producers are engaged, under natural or other conditions that result in inequality of advantages, the chances would be indefinitely great that the various units of supply must be procured at different costs. If doubts could have existed upon this subject a decade ago, the question would be finally settled now in view of the almost universal fact that our trusts have found that their constituent plants were, prior to consolidation, of very unequal efficiency.

The only difference that can be admitted between agricultural and manufactured products is that the former may show a much greater range of variation between the lowest and the highest costs. This is because the point of diminishing returns is so quickly reached in agriculture that increased production calls for the utilization of many grades of land possessing widely differing advantages of fertility and location. Even with manufactured products the possible differences of cost would not be the same for all commodities. In a branch that does not favor production upon a very large scale the variations would be wider than in another that permitted the concentration of production in a few large factories.†

If the case were otherwise, if all producers of manufactured commodities enjoyed equal advantages and supplied their goods at the same cost, there would be no room for those differential gains, recognized even by

\* Seligman states this most explicitly. *Shifting and Incidence*, 193-197. Some writers, in treating of value, assume different costs of production for every commodity. Walker, *Political Economy*, 100; Hobson, *Economics of Distribution*, 93, 97, 98; Commons, *Distribution*, 20. Hadley says: "If the demand for the products of any industry is too large to be met by a single organized source of supply, however great its natural advantages, we shall be likely to see a system of differential gains, due to the independent competition of men who make goods for the same market at different expense." *Economics*, 286.

† Seligman, *Shifting and Incidence*, 197, 198; Patten, *Stability of Prices*, 49; Bullock, *Introduction to Economics*, 204, 205.

Mill,\* which have played so important a part in modern theories of distribution.† We conclude therefore that, in competitive industry, under static conditions, the rule is that producers possess unequal facilities and unlike abilities, so that we may affirm the existence of a law of varied costs.

*B. Supply under Dynamic Conditions.*—The dynamic conditions of production have been studied by economists mainly when they have had occasion to consider the terms upon which the supply of commodities can be increased. Such questions arise in the study of economic prosperity and of the effect of changes of demand upon normal value.‡ In both cases the problem investigated is the productivity of land, labor, and capital in furnishing an increased supply of some given commodity.

Under conditions of monopoly, evidently, this question is identical with the one considered in our study of large-scale production; for we have to deal, in each instance, with the results of enlarging the output of a single industrial enterprise. But when competition exists, the problem becomes less simple.

Competition, as we have seen, results in varied costs for the several portions of the supply furnished at any time by different producers. Now when production increases, the important question is whether the cost of the marginal, or most expensive, unit rises or falls; for it is this unit that determines the normal value of the enlarged supply.§ Most economists now recognize three possible

\* *Principles*, Book III. chap. v. sect. 4.

† It is unnecessary to refer to authors, but note Hadley, *Economics*, 286.

‡ Economic prosperity has been studied principally in connection with the law of population. The effect of changes in demand upon value was studied by Senior (*Political Economy*, 119, 120) and by Mill (*Principles*, Book IV. chap. ii.). The importance attached to the subject has increased rather than decreased in recent years. Cf. Marshall, *Economics*, 446-452, 523-536; Nicholson, *Political Economy*, ii. 54-58; Hobson, *Economics of Distribution*, chap. iii.

§ For some purposes it is important to consider also the extent of the differential gains received by the producers who furnish the less expensive units. But this is apart from our present inquiry.

conditions under which an increment of supply may be secured,\*—increasing, constant, and decreasing returns. For the word "returns" we shall substitute "cost" in the following discussion, in order to avoid any possible confusion with the law of diminishing returns, which applies to a very different problem from that which is now under consideration.

Passing over the immediate effects of an increased demand,† it may be said that, when changing conditions call for a permanent enlargement of the supply, several different influences may be brought into play. As a consequence, the marginal cost of production under the new set of circumstances will be the resultant of a number of contending forces.‡ When due allowance is made for the effect of each of these, we shall see that it is more difficult than is ordinarily supposed to assign any particular commodity or industry to an invariable position in any scheme of classification.

One of these forces is the law of diminishing returns. If the product or industry in question does not permit the intensive application of labor and capital to any given area of land, then the increased demand will have a tendency to force producers to utilize inferior natural agents. Counteracting causes may prevent such a result from

\* Mill, although he saw that increased production of some commodities tended to lower the cost, made no use of that fact when he divided reproducible goods into two classes,—those that can be increased at constant cost and those not susceptible of multiplication except at increased cost. In this he was followed by Fawcett. So far as the writer has been able to determine, Professor Henry C. Adams was the first to make a place in the classification for a third kind of commodities,—those of which the supply can be enlarged at a decreasing cost. *Relation of the State to Industrial Action*, 55 (1887). For later writers see Marshall, *Economics*, 524, 525; Commons, *Distribution*, 124; Nicholson, *Political Economy*, ii. 54; Seligman, *Shifting and Incidence*, 199; Palgrave, *Dictionary of Political Economy*, iii. 489.

† The immediate result may be to raise the marginal cost of producing any commodity. See Marshall, *Economics*, 442, 443.

‡ Note Marshall, *Economics*, 398; Sidgwick, *Political Economy*, 190; Seligman, *Shifting and Incidence*, 202.

occurring ; but, undoubtedly, whenever the point of diminishing returns is quickly reached, the tendency will be towards a higher marginal cost for every increment of supply. This principle is most important in the case of extractive industries, and is of little or no significance for manufactures and commerce. But it must be observed that we are dealing with nothing more than a *tendency*. So far as anything yet said is concerned, it would be premature to conclude that agricultural or mining industry is in any given case likely to show an increased cost for an increment of supply.

A second factor is the law of economy in organization. If the conditions of an industry are such that an enlargement in the size of the average business unit will make for economy in production, then an increased demand for its products may give a stimulus to improved business organization, and lower the marginal cost at which the supply will be produced. This is, doubtless, often the case with manufactured commodities ; and it may seldom happen in agricultural industry. Yet it is merely a tendency, and may or may not actually produce a lower marginal cost, even in manufactures. To say nothing of other counteracting influences, it may happen that the increased demand may cause an excessive investment of new capital in *additional establishments*. If this should occur, the average size of a business unit might remain practically the same as before, so that there would be no reduction of marginal cost due to superior organization. In the woollen industry in the United States it has been asserted by manufacturers that our tariff has had this precise effect in several instances.

A third cause may be found in the stimulus which increased demand may give to inventions and all other improvements of method. These, obviously enough, may occur in agriculture and mining, as well as in manufactures ; and tend in all industries to lower the marginal

cost in times of prosperity caused by the growth of demand.

And, finally, a fourth consideration should not be overlooked. If monopolized materials enter into the manufacture of a commodity that is the product of a competitive industry, an increased demand for the finished article may not lower the money cost of production. The enlargement of the output of the industry in question would lead to an increased demand for the monopolized materials, and thereby raise the price which the monopolist can exact. This increased cost of materials would tend to counterbalance the economies which an increase of demand would make possible in other directions.

When all four factors are taken into account, it becomes difficult to predict what the precise result of increasing the production of any particular commodity will prove to be. It is certainly unsafe to assume, without much more careful investigation than has been made up to the present time, that in agriculture or mining an increased supply will regularly be produced at a greater marginal cost, and that manufactured commodities can be multiplied at a decreasing cost. We must recognize that any case may involve the operation of more than a single cause, and that, furthermore, the actual result may vary according to the extent to which the supply is increased.

In agriculture it is tolerably certain that a great increase of the product will force men to resort to inferior margins of cultivation. But this fact, as Chalmers rightly insisted,\* does not necessarily imply that there will be an actual increase in the marginal cost; for, "as the fresh soils that had to be successively entered on became more intractable, the same amount of labor, by the intervention of tools and instruments of husbandry, may have become greatly more effective." Without doubt, as economists have argued, an indefinite increase of population might

\* *Political Economy*, chap. i.

ultimately force the margin of cultivation down so far that no improvements could counteract the operation of the principle of diminishing returns. But this is not the same as saying that the marginal cost has risen in the past, or that it will rise under the pressure actually exerted by any future growth that population is likely to show. Economists at the present day have recognized this fact, and are decidedly less inclined than were their predecessors to take a pessimistic view of the situation.\* When we consider that scientific agriculture is merely in its infancy, and that improvements in mechanical trades react upon extractive industry, we are justified in demanding serious proof before we concede that any given increase in the demand for food will necessarily raise the marginal cost of production. Undoubtedly, it may have that effect; but we have no proof that agriculture is always governed by a law of increasing cost.†

In the case of mining the situation is nearly the same, and the chief point of difference is that in the production of minerals the forces that tend to increase the marginal cost may be further neutralized by the economies that come from concentration. Fixed capital plays such an important part in modern mining operations that a definite increase of demand may, by increasing the average scale of production, tend powerfully to lower the marginal cost. Beyond all question the ultimate exhaustion

\* Marshall says merely that "a continued increase in the application of labor and capital to land must ultimately result in a diminution of the extra produce." *Economics*, 230. Nicholson says that "the law gives no countenance whatever" to the assertion that "the absolute cost of production of corn must increase." *Political Economy*, i, 163, 164, 173. "What may happen at the end of time" he considers "a matter for prophecy and beyond the range of science." Commons says that, in the past, agriculture "has constantly shown increasing returns." *Distribution*, 119. Note, also, Devine, *Economics*, 360.

† The tendency of economists to classify agriculture as an industry governed by increasing cost is due in some measure to a failure to discriminate between the two standpoints recognized in this essay,—the productivity of investments made under static conditions upon a given area and the productivity of an entire industry under dynamic conditions.

of mineral deposits, as well as the operation of the law of diminishing returns from a given area, would cause a higher marginal cost if the demand should increase without limit. But whether any particular increase of output will be obtained with greater or with less difficulty must be settled by an investigation of the actual conditions of the case, and not by reference to an arbitrary classification of mining as an industry that inevitably shows increasing marginal cost.\*

In manufactures the strength of the forces that make for a decreasing marginal cost is, doubtless, at a maximum. Even when the raw materials must be procured at an increased cost, the growth in the size of factories and the constant progress of invention would often result in cheaper production of the finished commodities. Yet it would be dangerous to say that in manufacturing industry a larger supply can always be furnished at a lower cost. There may be at any time a limit to the size of a factory of maximum efficiency, and the progress of invention may not necessarily keep pace with every increase of demand. Such conditions might result in a higher marginal cost for an increased supply, even apart from a possible rise in the cost of raw materials. All that can be claimed is that manufactures are subject to a law of decreasing cost more often than agriculture or mining, and that the rate of decrease in this industry is often greater than it is in the others. Then, also, it is necessary to remember that the results will vary according to the extent to which the supply is to be increased. When an increase of 20 per cent. can be secured at a lower marginal cost, an increase of 40 per cent. may lead to a higher marginal cost of production. In any event the reduction of cost could not continue indefinitely, else the commodity would finally become a free good.

\* In England it is possible that a very large increase of the output of iron or coal would be attended with an increased marginal expense. In the United States it would be very dangerous to predict that such would be the inevitable result.

In current discussions it is usually assumed that there will be many cases in which the marginal cost will remain stationary as the output of an industry is increased, so that we may have a law of constant cost. But such a result could be brought about only by an accidental equivalence of the various contending forces which are set in operation by an increased demand for any commodity.\* In almost all cases the chances would be greatly against a precise balancing of these opposing influences, so that, in strictness, we must conclude that the usual result of enlarging the output is to raise or lower the marginal cost.† But in practice the change in the position of the marginal producer may often be so slight, especially when the supply is increased to only a moderate extent, that no material error is involved in speaking of a condition of constant marginal cost. Even in such cases, however, it would be better to recognize that the conditions are those of increasing or decreasing cost, and then to make allowance for the fact that the change is so small as to be negligible.

Our conclusion is, therefore, that under dynamic conditions we find a law of decreasing and a law of increasing marginal cost, when we consider the efficiency of land, labor, and capital employed in the production of the entire supply of a commodity. It seems to be impossible, however, to assign to any particular commodity or industry a fixed place in schemes of classification based upon these laws; and it is especially important to remember that the result of any alteration of supply may depend upon the extent of the change that is to be effected. Before applying these laws to any concrete case, we need far more serious study than has yet been made of the actual condi-

\* This is perceived by Sidgwick, *Political Economy*, 190.

† Professor Carver, in discussing the incidence of taxation, mentions only two classes of commodities produced under competitive conditions,—those supplied under increasing and those furnished under decreasing "returns." *Yale Review*, v. 259.

tions of the industry in question. Without such particular investigation, attempts to utilize the laws of increasing or decreasing cost are as likely to cause error as to conduce to scientific insight.

## V.

It remains for us to consider the manner in which the various principles above formulated have been applied to the problems of monopoly, value, and the incidence of taxation. In treating the first of these subjects, economists have often said that the so-called "law of increasing returns" is the primary cause of the growth of modern monopolies. Professor Adams, for instance, has divided industries into three classes,—those showing constant, diminishing, and increasing "returns,"—and has declared that in those cases where the "law of increasing returns" prevails there is an inevitable tendency towards monopoly.\* Similar views have been expressed by not a few other writers.†

It is at this point that the distinction which we have drawn between the law of economy in organization and the laws of increasing or decreasing cost proves most helpful. The writers to whom reference has been made pass unconsciously from the standpoint of a single establishment to that of an entire industry, and apply the same principle, which they call "increasing returns," to both cases.‡ But it is clear that an industry can show a de-

\* *Relation of the State to Industrial Action*, 55, 59, 60.

† Seligman, *Shifting and Incidence of Taxation*, 202, 203; *Yale Review*, v. 270; Ely, *Outlines of Economics*, 297. In his *Monopolies and Trusts*, 61-65, Professor Ely makes some changes in the statement of the principle. Professor Commons classifies industries in a similar manner, but does not say, except perhaps by implication, that where an industry shows "increasing returns" there will be an inevitable tendency towards monopoly. *Distribution of Wealth*, 124. English writers have, generally, at least, avoided the statement that a condition of "increasing returns" in an industry necessarily implies monopoly.

‡ Thus Professor Adams begins with a discussion of the laws applicable to "industries," and then proceeds to examine the situation of "an established

creasing cost for the marginal unit of an increased supply without exhibiting, necessarily, any tendency towards monopoly.\* The cost of the marginal unit may be lowered by the general stimulus to inventions caused by an increased demand, and this may happen even in the case of agricultural products that are not produced by the methods of large-scale production. Moreover, even when the decreased cost is due wholly or in part to the fact that the growth of demand has made it possible for the average establishment to enlarge its scale of operations, it is probable that in many industries any one establishment will reach a point of maximum efficiency before it develops into a monopoly. By maintaining the distinction between the law of economy in organization and the laws of increasing and decreasing cost, the possibility of confusion at this point is easily removed.

In studying the theory of value, it is necessary to adhere rigidly to the consideration of the conditions that govern an entire industry, and then to discriminate between the static and dynamic problems involved. Our law of normal value should be formulated first of all for static conditions of supply and demand, and we should then study the changes of value that result from dynamic conditions.

Modern theories of value have succeeded in co-ordinating the principle of marginal utility, which governs demand, with the old doctrine of cost of production, which related to the conditions of supply.† Since, however, this

business" or "an expanding enterprise." *Relation of the State to Industrial Action*, 55, 57, 59. Professor Commons, in spite of his usual care to separate the two standpoints, explains the condition of "increasing returns" in an *industry*, by saying that the "larger the enterprise," the "cheaper the cost per unit of quantity of product." *Distribution of Wealth*, 124. Cf. Ely, *Economics*, 297.

\* This was stated by Professor Seligman in the first edition of his *Shifting and Incidence*, 146, note.

† This, I take it, is the service rendered by Professor Marshall's treatment of the theory of value. Cf. Commons, *Distribution of Wealth*, chap. i.; Hadley, *Economics*, chap. iii.; Hobson, *Economics of Distribution*, 68-70.

essay is concerned with the question of the efficiency of the process of production, we shall, in our study of static conditions, neglect altogether the laws governing demand, and consider solely the terms upon which supply is furnished. Under a régime of monopoly, it has been shown that the cost of production must be considered to be uniform for all the units of the supply. But, under competitive conditions, the universal rule is that the different portions of the supply are produced at varying costs.

Now it is this law of varied costs that must be applied in determining the normal value of any commodity, under conditions of competition. At any given stage of production the normal value must correspond to the cost of furnishing the marginal, or most costly, unit of the actual supply. It is not the average cost or the cost to a representative firm, but the marginal cost of production that is decisive in fixing the normal value of all commodities. In this respect, manufactured goods differ in no way from the products of the farm or the mine;\* and it is at this point that our law of varied costs finds its all-important application.

Passing now to dynamic conditions, we shall consider the subject that has received most attention from economists,—the effect of changes in demand upon the terms on which commodities are produced, and hence upon their normal value. In this connection, attention is usually directed mainly to the results of an *increased* demand; and it is at this point that the laws of increasing and decreasing cost find their principal application. We need not hesitate to accept the current doctrine that an increased demand for a commodity that can be furnished at a decreasing cost for the increment of supply actually required will have the effect of lowering the normal value,

\* For illustrations of the confusion arising at this point, from the failure to discriminate between static and dynamic conditions, see Gide, *Political Economy*, 67, 68; Hadley, *Economics*, 88, 89.

and that the opposite effect will be produced when the industry in question conforms to the law of increasing cost. But the results of our earlier discussion lead us to insist that the actual result in any concrete case must be determined by a careful consideration of the situation of the industry, and that it is impossible to make the general assumption that manufactured articles can be multiplied uniformly at a decreasing cost, while agricultural or mineral products are necessarily supplied under the opposite conditions. Moreover, we have found reason for doubting whether it is possible to assume the existence of a class of industries of which the output can be increased at a strictly constant cost.

But, when we turn to a consideration of the effects produced by a decrease in the demand, we find that the theories generally accepted lead to an erroneous conclusion. The current doctrine is that, when an industry conforms to the law of decreasing cost, a reduction in the demand, which enforces a curtailment of the supply, will raise the cost of production, and consequently the normal value of the product.\* Upon the other hand, it is contended that, in industries subject to a law of increasing cost, the reduction of the supply will lower the marginal cost of production and decrease the normal value. This last doctrine is undoubtedly true; but we shall endeavor to prove that the first conclusion is incorrect, and is based upon a confusion between the conditions that control the output of a single establishment and those which govern the product of an entire industry.

Economists who believe that a reduction in the supply of a commodity subject to the law of decreasing cost will raise the marginal cost of production, tacitly assume that the decrease of the product affects all competitors in proportion to their outputs, reduces the scale upon which the average establishment is conducted, and therefore in-

\*See Nicholson, *Political Economy*, ii. 56; Marshall, *Economics*, 525, 526.

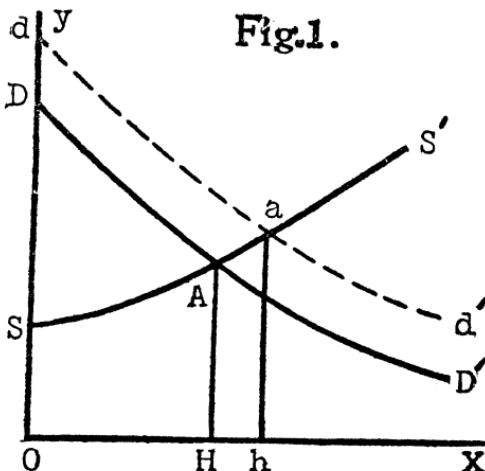
creases the cost. In so doing, they assume that what would be true if one establishment furnished the entire supply, will be true when the product comes from scores or hundreds of competing enterprises. This assumption is wholly inadmissible. The necessity of reducing the entire supply will generally have the effect of forcing out of business the marginal producers, who labor under the greatest disadvantages; and, after production is decreased in this manner, the remaining establishments will be able to conduct their operations upon the same scale as before. This is the precise result which these writers assume to occur in the case of industries that are subject to the law of increasing cost; and there is no reason why the situation should be different in the one case from what it is in the other. Mr. Sidgwick seems to be the only economist who has appreciated this fact, and his statement of the case is worth quoting: \* "It does not follow from this that a fall in demand will have a similar tendency to increase the cost of production: in most cases the effect of such a fall would, I conceive, rather be to diminish the number of separate establishments in which the branch of production in question was carried on."

It may be conceded that in an industry where there were only a few large enterprises, of nearly the same grade of efficiency, the *immediate* effect of the reduction in the demand might be to decrease the output of all the establishments in almost similar proportions, and therefore in some cases to raise the cost of production. But, if the reduction in demand proved to be permanent, and did not drive the producers into a combination, competition would ultimately eliminate the weakest establishments, and leave the stronger in the same position that they had formerly occupied. Such a case would differ from any other only in respect of the ease and promptness with which the industry adjusted itself to the change in business conditions.

\* *Political Economy*, 195, note.

The difference is certainly worthy of notice, but it does not affect the ultimate working of our principle.

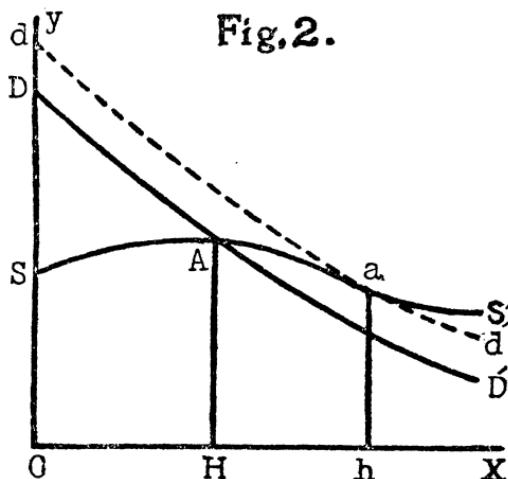
The erroneous views that have been entertained upon this point are caused by the failure to discriminate between the law of economy in organization and the law of increasing or decreasing marginal cost. Even if the re-



duced cost of the larger supply resulted solely from the fact that the increased demand had enabled the various establishments to produce upon a larger scale, it would not follow that a subsequent decrease in the demand would compel all competitors to curtail their operations. This, we believe, has been sufficiently demonstrated. But, as a matter of fact, the lower cost of an enlarged supply may be the result of general improvements which are introduced throughout the industry in consequence of the stimulus imparted by a growing demand. Now it is evident that no future reduction in the output will drive producers back to the use of discarded machinery and methods; so that in all such cases there is no reason for thinking that a decreased demand will raise the marginal cost. As a general rule, therefore, we must hold that

a curtailment of supply will force the weakest producers out of the field, and will not ultimately restrict the operations of the remaining competitors.

The error involved in the current theories will become evident when we consider the diagrams usually employed to illustrate the point in question. Mr. Marshall, for in-



stance, presents the following diagrams in order to show the effects of the laws of increasing and decreasing cost: \* —

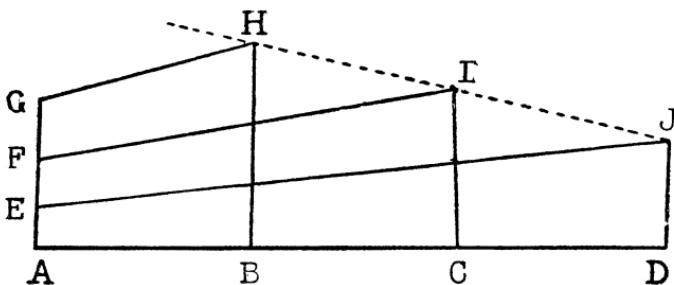
The first figure, which applies to an industry of increasing cost, calls for no comment. But the second, which illustrates the law of decreasing cost, is open to criticism. For our purpose it is sufficient to examine the supply curve, SS'. This curve begins to decline after the supply is increased beyond OH units, and it represents nothing more than the rate at which the cost of the *marginal unit* decreases as the output is enlarged. It does not represent the cost of producing *all* the units of the commodity, and can give us no idea of what will happen when the supply is reduced.

In order to show the effects of the law of decreasing

\* *Economics*, 525.

cost upon the conditions of an industry,—*i.e.*, upon the entire supply of a commodity subject to the operation of competition,—the supply curve \* must be constructed as follows:—

Fig. 3.



Here we assume that AB units can be produced at a marginal cost of BH, and that producers possessing superior ability or facilities will furnish their portions of the supply at varying costs represented by the line GH. Then we assume that, if the supply is increased to AC or AD, the marginal cost will fall to CI and DJ, respectively; while the superior producers will furnish their outputs at costs represented by FI in the first case and EJ in the second. For each stage of production the normal value will depend upon the marginal cost.

If now we assume that an increased demand has enlarged the output from AB to AC, and reduced the normal value from BH to CI, we are in a position to determine the effect of a subsequent reduction of the demand. When such a change occurs, the supply will be reduced to something less than AC; and the marginal cost will also recede from CI to some other point along the line FI. In other words, a decreased demand will lower the normal value by forcing out of business the weakest producers, whose costs of production approximate or equal CI. We

\* For the sake of simplicity, I shall omit the demand curve, and assume an equilibrium of supply and demand at BH, CI, and DJ, under the various conditions assumed.

are able also to demonstrate the precise nature of the error to which Mr. Marshall's diagram leads. His supply curve, SS' (Figure 2), is the same as the line joining the points H, I, and J (Figure 3). It represents merely the rate at which the marginal cost falls when the supply is enlarged, and does not show the cost of production of the various units of any given quantity of the product, AB, AC, or AD.

For studying the effects of an increasing demand the supply curve drawn by Mr. Marshall will suffice, since all we need to know in that case is the position of the marginal cost of production. But when we consider the result of a subsequent decrease in the supply, it is necessary to draw the lines GH, FI, and EJ, which represent the varying costs at which all except the marginal units are supplied. When this is done, it becomes evident that a decreased demand will lower the marginal cost, and hence the normal value, of commodities subject to the law of decreasing cost as well as of those governed by the law of increasing cost.

And, finally, we come to certain problems relating to the incidence of taxes imposed upon commodities. It was the theory of Ricardo that \* "the taxing of all commodities, whether they be necessities or luxuries, will, while money remains at an unaltered value, raise their prices by a sum at least equal to the tax." But Senior made a distinction between manufactured goods and raw produce, holding that † "taxes on manufactured commodities ultimately raise the price, and that by an amount exceeding the amount of the tax. Taxes on agricultural produce in its unmanufactured state do not necessarily occasion any ultimate rise of price, and raise it, if at all, by an amount less than that of the tax." His reason for this opinion was that a tax upon manufactured goods would raise the cost of production by decreasing the quantity produced:

\* *Principles of Political Economy*, chap. xvii.

† *Political Economy*, 120-124.

whereas, in the case of raw produce, the consequent reduction of supply would throw the poorest lands out of cultivation, and so lower the cost. In this direction, Senior was followed by John Stuart Mill.\*

Later writers have made use of the laws of increasing and decreasing cost, and have held that a tax upon commodities subject to the law of increasing cost will raise the price by less than the tax, while a tax upon articles produced at a decreasing cost will increase the price by more than the amount of the tax.† But such a statement of the laws of incidence depends upon the erroneous inference from the law of decreasing cost which we have criticised in previous paragraphs.

We have seen that, even if the supply of a commodity can be increased at a decreasing cost, it does not follow that a reduction in the output, such as would be caused by a tax, would raise the marginal cost of production. The tax would drive the marginal producers out of the field, and would lower the cost of the marginal unit produced under the altered conditions. Therefore, there is no ground for discriminating between manufactured goods and raw produce or between commodities furnished at a decreasing cost and those supplied at an increasing marginal outlay.‡ In all cases we must assume that a certain stage of production has been reached at the time the tax is imposed, and that the tax merely drives the weakest competitors out of the industry. It is true that taxation may restrict the subsequent development of an industry in various ways, and that it may prevent a future reduction of the marginal cost through an increase which would have occurred otherwise in the demand. But this

\* *Principles*, Book V. chap. iv. sects. 2 and 3.

† Marshall, *Economics*, 526-530; Nicholson, *Political Economy*, ii. 57, iii. 310, 341; Seligman, *Shifting and Incidence*, 207-209; Daniels, *Public Finance*, 71; Davenport, *Outlines of Economic Theory*, 220.

‡ This discussion relates, of course, solely to competitive conditions. The incidence of taxes upon monopolized products is not now considered.

is a different question. There seems to be no reason for thinking that the imposition of a tax will raise the marginal cost above the level that formerly prevailed, and therefore increase the price by more than the tax. In all cases it would seem that the result must be to increase the price by something less than the amount of the tax.

The error which Mr. Marshall and others make in the use of the supply curve drawn to represent the condition of decreasing cost becomes very apparent when this question of incidence is considered. Thus Marshall draws a curve \* parallel to the original supply curve,  $SS'$  (Figure 2), and assumes that this represents the conditions of supply after the imposition of a tax. But his original curve,  $SS'$ , does not represent the cost of any except the marginal units of successive increments of supply; and the cost of the units furnished by superior producers must always be less than that of the marginal unit. The conditions subsequent to the levying of a tax can be represented only by drawing, in Figure 3, lines parallel to  $GH$ ,  $FI$ , or  $EJ$ , according as the supply, at the time when the commodity is taxed, is  $AB$ ,  $AC$ , or  $AD$ . When this is done, the resulting diagram becomes precisely like the one which Marshall uses in studying the effects of taxing commodities subject to the law of increasing cost, and the incidence of the tax is seen to be the same in both cases.

A single point remains to be considered. When a tax causes a reduction of the supply, it may happen that the marginal producers who are forced out of business will remove from the market a larger quantity of the product than needs to be withdrawn in order to establish a new equilibrium between the demand and the supply. In any case when this happens, the remaining producers will be able to increase their sales before the deficiency in the supply offered under the new conditions is made good.

\* *Economics*, 527, 530. Cf. Seligman, *Shifting and Incidence*, 209.

Whenever this condition occurs, therefore, the tax may result in an enlargement of the size of the remaining establishments and a further reduction of the marginal cost.\* Whether this is anything more than a mere theoretical possibility need not now be considered.

The three problems just discussed are far from exhausting the possible applications of the principles with which this essay has dealt, but they are sufficient to show the importance of the distinctions for which we have contended. In conclusion, it may be suggested that the various laws which we have presented should be looked upon as the special forms in which a more general principle manifests itself. This larger principle may be called the law of the variation of productive forces,† and the final results of our argument may conveniently be summed up in the following table:—

Laws of the variation of productive forces.	I.	Of a given area of land.	Law of diminishing returns.				
	II.	Of a single plant or establishment.	Law of economy in organization.				
	III.	Of an entire industry.	<table border="0"> <tr> <td>1. Under static conditions.</td> <td>Law of varied costs.</td> </tr> <tr> <td>2. Under dynamic conditions.</td> <td> <table border="0"> <tr> <td>Laws of increasing or decreasing cost.</td> </tr> </table> </td> </tr> </table>	1. Under static conditions.	Law of varied costs.	2. Under dynamic conditions.	<table border="0"> <tr> <td>Laws of increasing or decreasing cost.</td> </tr> </table>
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Laws of increasing or decreasing cost.							

It is not claimed that this classification includes all the forms in which the operation of the general law of variation is manifested. But it is hoped that the results that

\* This has been noted by Professor Carver in *Yale Review*, v. 263, note. Something similar is noted by Professor Seligman in discussing license taxes. *Shifting and Incidence*, 292, 293.

† This law, as Professor Clark suggests, may be correlated with the law of diminishing utility under the general designation of the laws of the "variation of economic results." *Distribution of Wealth*, 209.

have been reached will remove the confusion that has existed at several points, and prepare the way for future investigations of the working of this most fundamental principle in economic science.

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